

and claim 7 has been cancelled. New claims 18 and 19 have been added. Applicant respectfully requests reconsideration of the present rejections.

Status of the Office Action

In the Office Action Summary, boxes 2a and 2b were checked, indicating that the present Office Action is both a final and a non-final action. Applicant respectfully submits that a Final Office Action is improper at this time because the Examiner presented new reasons for rejection in response to Applicant's Request for Reconsideration (without claim amendments). Thus, the present Amendment is fully responsive to the present non-final Office Action.

New Claims and Claim Amendments

Claims 1-6 and 8-17 have been amended. Claim 1 was amended to recite a method of producing a stabilized silicon film, including the steps of providing a silicon film deposited on to a substrate, illuminating the surface of the film with UV light to form a light damaged region and a stabilized region beneath the light damaged region, and etching the light damaged region to expose a portion of the stabilized region. Support for the formation of a light damaged region and a stabilized region after UV illumination may be found in Figure 1, and page 6, lines 1-6 and 14-17. Claim 3 was amended to recite that the light damaged region extends 700-1000 Å below the film surface, and new claims 18 and 19 recite the step of etching to remove about 700Å of the silicon film. Support for these amendments is found in the examples.

Claim Rejections – 35 USC § 112

Claim 7 was rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 7 has been cancelled.

Claim Rejections – 35 USC § 103

Claims 1-3 and 8-17 were rejected under 35 U.S.C. 103(a) as being unpatentable over Hollingsworth (U.S. Pat. No. 5,759,745) and Fukaya et al. (U.S. Pat. No. 4,581,009).

Specifically, the Office Action stated that Hollingsworth discloses all features of claim 1 except for etching the illuminated surface to remove the defect, and that Fukaya teaches termination of dangling bonds by etching with halogen atoms.

Claim 1 has been amended to recite that the amorphous silicon film is illuminated with UV light to form a light damaged region and a stabilized region. Furthermore, claim 1 has been amended to recite the step of etching the light damaged region to expose the stabilized region. Hollingsworth reports exposing portions of an amorphous silicon layer to UV light to form a silicon dioxide layer at the surface of the amorphous silicon layer (col. 6, lines 20-35). The exposed portions are not etched, but instead form an etch resistant layer that may be used in place of conventional organic photoresists (col. 7, lines 18-38). Fukaya reports a method for preparing a photosensor by depositing a layer of p-type amorphous silicon semiconductor, followed by an ohmic contact layer of n-type amorphous silicon, followed by an electrode layer (col. 2, lines 40-52). Portions of the electrode layer and the ohmic contact layer are then etched with CF_4 to expose the p-type silicon layer (col. 3, lines 40-45).

It is respectfully submitted that the combination of Hollingsworth and Fukaya does not disclose the steps of UV exposing an amorphous silicon layer to form a light damaged region **and** a stabilized region, and then etching away the light damaged region to expose the stabilized region. Hollingsworth reports a method of forming an etch-resistant layer wherein the UV exposed amorphous silicon is **not** etched away to expose a stabilized region, but rather, acts as a photoresist during the etching cycle. Fukaya merely reports a method of preparing a photosensor wherein the surface characteristics of the p-type semi-conductor may be improved during exposure to the halogen etchant. Applicant respectfully requests that this rejection be withdrawn.

Claims 4-7 were rejected under 35 U.S.C. 103(a) as being unpatentable over Hollingsworth, Fukaya and Shimbo (U.S. Pat. No. 4,624,737). Specifically, the Office Action provided that Hollingsworth fails to teach using a liquid etchant, but that Shimbo reports etching amorphous silicon with a wet etchant.

Claim 7 has been cancelled. The combination of these references does not teach the illuminating and etching steps of claim 1, upon which claims 4-6 depend. The arguments made above regarding Hollingsworth and Fukaya are reiterated for the purposes of this rejection. Shimbo reports using a liquid etchant to form electrodes for a semiconductor. The semiconductor is not UV illuminated to form a light-damaged and a stable region, nor etched to expose a stable region. Thus, the combination of these references does not disclose every features of claims 4-6. Applicant respectfully requests that this rejection be withdrawn.

CONCLUSION

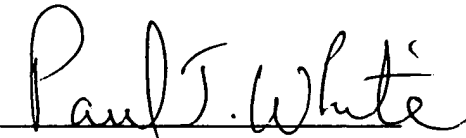
All pending claims are now in condition for allowance. A notice to that effect is respectfully requested.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "Version with markings to show changes made."

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Respectfully Submitted,


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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Claims:

The following claims have been amended:

1. (Once Amended) A method of producing a ~~an~~ stabilized amorphous ~~hydrogenated~~ silicon film ~~resistant to metastable degradation~~, comprising the steps of:

(a) ~~growing~~ providing a hydrogenated ~~an~~ amorphous silicon film deposited on to a substrate, the film having an exposed surface;

(b) illuminating the surface film with an essentially blue or ultraviolet light to form ~~high densities of a light induced defect near the surface~~ a light damaged region and a stabilized region; and

(c) etching the ~~surface to remove the defect~~ light damaged region to expose a portion of the stabilized region.

2. (Once Amended) The method of claim 1 further comprising using the amorphous ~~hydrogenated~~ silicon film in an electronic, optoelectronic, or photovoltaic device.

3. (Once Amended) The method of claim 1 wherein the ~~defects are in a near-surface region~~ extending light damaged region extends ~~1,000~~ 700-10,000Å into below the film surface.

4. (Once Amended) The method of claim 1 wherein etching comprises using a liquid etchant to remove 500 – 10,000Å of the ~~surface~~ silicon film.

5. (Once Amended) The method of claim 1 wherein etching comprises using a reactive hydrogen in a plasma or chemical vapor deposition reactor to remove 500-10,000Å of the ~~surface~~ silicon film.

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6. (Once Amended) The method of claim 1 further comprising ~~after etching~~, repeating the steps of illuminating and ~~then~~ etching for a plurality of cycles ~~wherein a population of two-~~ hydrogen complexes is increased in a bulk of the film.

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8. (Once Amended) ~~A hydrogenated~~ An amorphous silicon film produced according to the method of claim 1.

8
9. (Once Amended) ~~A hydrogenated~~ An amorphous silicon film produced according to the method of claim 3.

9
10. (Once Amended) ~~A hydrogenated~~ An amorphous silicon film produced according to the method of claim 6.

10
11. (Once Amended) The method of claim 1 wherein growing providing, illuminating, and etching are performed as steps in an ~~a-Si:H~~ amorphous silicon film deposition process.

11
12. (Once Amended) The method of claim 3 wherein growing providing, illuminating, and etching are performed as steps in an ~~a-Si:H~~ amorphous silicon film deposition process.

12
13. (Once Amended) The method of claim 6 wherein growing providing, illuminating, and etching are performed as steps in an ~~a-Si:H~~ amorphous silicon film deposition process.

13
14. (Once Amended) The method of claim 1 wherein the ~~a-Si:H~~ amorphous silicon further comprises an alloy selected from the group consisting of a-SiGe:H and a-SiC:H.

14
15. (Once Amended) The method of claim 3 wherein the ~~a-Si:H~~ amorphous silicon further comprises an alloy selected from the group consisting of a-SiGe:H and a-SiC:H.

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16. (Once Amended) The method of claim 6 wherein the ~~a-Si:H~~ amorphous silicon further comprises an alloy selected from the group consisting of a-SiGe:H and a-SiC:H.

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17. (Once Amended) The method of claim 9 wherein the ~~a-Si:H~~ amorphous silicon further comprises an alloy selected from the group consisting of a-SiGe:H and a-SiC:H.